REMARKS

Claims 1-11 are currently pending in the application. The foregoing separate sheets marked as "Listing of Claims" show all the claims in the application, with an indication of the current status of each .

Proposed drawing corrections were submitted with the prior response, but the Examiner has given no indication whether these proposed drawing corrections have been approved. Such an indication is respectfully requested.

The Applicants in good faith attempted to respond to the Examiner's first office action. In the present office action, the Examiner indicates that the Applicants' prior response failed to respond to the Examiner's first office action. The Examiner then repeated the grounds of rejection stated in the first office action. In particular, the Examiner asserts that the Applicants have not considered the combination of references but rather have attacked them separately. This is incorrect. Further, the Examiner asserts that the argument presented by the Applicants evaluated the specific disclosures of the references rather than what these disclosures would suggest to one skilled in the art. This is also incorrect.

In support of his argument the Examiner cites the unpublished *Tri-Tronics* case which in turn cites *In re Merck*, 231 USPQ 375 (CAFC 1986). In *Tri-Tronics*, the court said

> "Tri-Tronics does not seriously challenge the suggestions of the combinations of the prior art or the secondary considerations. Rather, Tri-Tronics limits its analysis to each piece of prior art individually, asserting in conclusory fashion that each reference is 'cumulative' over the previous reference." *Tri-Tronics*, at 1392.

The argument of the Applicants does no such thing. Each argument links one reference to the other, explaining in detail why the combination suggested by the Examiner would not be suggested to one skilled in the art and would not work even if pursued, absent impermissible hindsight. In particular, specifically contrary to the

Examiner's assertion, the Applicant's argument with respect to the Takriti reference is explicitly tied to the set covering model used by the Sandholm reference. The Examiner has simply mis-characterized the Applicants' argument. The *Merck* case merely states the general proposition that references cannot be read in isolation. Since the Applicants have not read the references in isolation, as summarized above and repeated in detail below, the Examiner's citation to *Merck* is inapposite.

Consequently, the Applicants respectfully request that the Examiner reconsider his rejection and withdraw the finality of the rejection, on the grounds that no *prima facie* showing of obviousness has been made.

The Applicants have carefully reviewed the application, the references cited by the Examiner, and the analysis presented by the Examiner. However, while the Examiner's statements of basic principles for examination of references is correct the Examiner's argument is inapposite. It is addressed to common errors that may be made by those seeking patent protection, but were not in fact made by the Applicants. Further, these same basic principles are equally subject to errors on the side of the Examiner. In particular, not only must the references be considered as a whole but they must be considered without the benefit of impermissible hindsight provided by the claimed invention. Further, the references must suggest the desirability of making the combination and – from the viewpoint of one skilled in the art without the benefit of hindsight – there must be a reasonable expectation of success. Only if these conditions are satisfied can a conclusion of obviousness be justified. *MPEP* 2141. There must be independent evidence to support the conclusion to combine different references. *Smith Industries Medical Systems Inc. V. Vital Signs Inc.*, 51 USPQ2d 1415, 1421 (CAFC 1999). Nowhere has the Examiner pointed to such evidence. Analysis, in the form of a mis-characterization of Applicants' argument, is no substitute for evidence. *In re Lee*, 61 USPQ2d 1430, 1435 (CAFC 2002). The Examiner's reliance upon *In re Bozek*, 416 F.2d 1385, 163 USPQ 545 (CCPA 1969) for a contrary analysis is misplaced:

> "Nor does *Bozek*, after thirty-two years of isolation, outweigh dozens of rulings of the Federal Circuit and the Court of Customs and Patent Appeals that determination of patentability must be based on evidence." *In re Lee*, op.cit.

The Applicants respectfully request the Examiner to reconsider whether his own arguments – as presented in the first office action and repeated in this office action – satisfy the foregoing legal standards for combining references. The burden of establishing a *prima facie* case of obviousness is upon the Examiner. Absent an argument that adduces evidence – currently absent – that one skilled in the art at the time of the invention would have seen in the combination both a desirability of making the combination and a reasonable probability of success, a *prima facie* case has not been established. Bluntly put, there is no evidence to support the Examiner's *pro forma* assertion that one skilled in the art would have seen in the Sandholm/Takriti combination a path to the present invention. Quite the contrary is evident on the record.

The focus of the invention is the incorporation of business rules for bid evaluation in the context of reverse combinatorial auctions. Incorporating such rules into a basic optimization model is inherently difficult and changes the nature of the mathematical model substantially. Thus it is not feasible – from the point of view of one skilled in the art at the time the invention was made, without the hindsight provided by the invention – simply to cobble together aspects of the invention from diverse sources. For example, Sandholm's method does not permit use of linear programming relaxation to guide the search. Consequently, introducing business rules as constraints renders Sandholm's methods unusable. Taking Sandholm in the direction of the present invention is a blind alley, which would have been obvious to one skilled in the art.

Furthermore, the approach taught by Takriti cannot simply be combined with a set covering model to generate a useful model for bid evaluation. A fundamental reworking of the set covering model to incorporate business constraints is required.

Note that Takriti (col 9, line 49 to col 10, line 16) provides a method for sampling the uncertainty in price distributions and does not allow for the introduction of constraints on the number of winning suppliers. The combination proposed by the Examiner would not have suggested any helpful course of action to one skilled in the art; indeed, the combination would have been rejected by one skilled in the art as a blind alley without any evident probability of success. Obviousness is not provided by the combination of references, but rather by hindsight from the invention itself. This lack of obviousness is evident precisely from consideration of the references as a whole. By considering the references as a whole the lack of any practical connection between the references becomes evident. It is only by considering the references separately, and cobbling them together without considering the point of view of one skilled in the art, can an argument of obviousness be made. There is therefore some irony in the Examiner's protest that the Applicants have attacked the references separately. The record supports quite the contrary conclusion.

The claimed invention is directed to an improved computer implemented method for selecting bids in a reverse combinatorial auction. The method according to the invention automatically selects the optimal bid when commodities are offered in bundles by automatically generating an algorithm which may be implemented on a computer for solving the cost-minimization problem. The auction is run as a procurement auction, where the buyer (e.g., a manufacturer) wishes to purchase different items of varying quantities for the cheapest overall price. The total quantity of each item is referred to as a lot and is treated as an indivisible unit of some weight. Suppliers can bid on combinations of items; however, a bid on any item has to be for the entire lot for that item. The present invention identifies the optimal solution to the so-called winner determination problem for a single-unit reverse combinatorial auction by selecting a winning set of bids such that each item is included in at least one winning bid. As a result, the total cost of procurement is minimized. This problem is a set covering problem, which is known to be NP-hard. NP-hard problems

are problems that are difficult to solve and the amount of effort (in terms of the time required on a computer) increases exponentially as the size of the problem (such as number of bids) increases. For example, if the number of bids goes from 100 to 200, then the time required to solve the problem might go from 10 seconds to 100 seconds (not 20 seconds).

The claimed invention provides an algorithm for identifying a cost-minimizing bid set in a reverse combinatorial auction subject to various business rules for all-or-nothing bundled bids, and second by providing a method for automatically generating this algorithm in a form that can be used with commercial Linear Programming/Integer Programming (LP/IP) solvers. In accordance with the invention, a computer-implemented formulation is generated by populating a set of matrices. Since the matrix is generally sparse, it is represented in a sparse form by providing only the non-zero terms. This is done by specifying a large array of non-zeros indexed by an integer array that indexes the row number for each non-zero entry. Additionally, two column vectors are specified that indicate the column index for the non-zero entry. These arrays are automatically generated, and the matrices are then automatically generated based on the formulation of the present invention.

The basic steps for populating these matrices are as follows:

1. Given the number of suppliers, N, and the bids M_i for each supplier, the number of minimum (S_{min}) and maximum (S_{max}) winning suppliers.

2. Identify the number of decision variables as $\sum_{i \in N} M_i + N$.

3. Identify the total non-zero entries in the matrix A based an the number of items in each bid and the total number of suppliers.

4. Identify the number of rows in the matrix based on the total number of items and suppliers.

5. For each bid, introduce a column and populate the matrix A with non-zero elements with appropriate row and column indices.

6. For each bid, populate the cost vector c with the bid price.

7. Call a commercial solver with these matrices as input and invoke the solver.

8. Read the winning bids found by solver.

Claim 1 was rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 6,272,473 to Sandholm in view of U.S. Patent No. 5,974,403 to Takriti et al. ("Takriti"). This rejection was traversed in the prior office action and this traverse is respectfully maintained for the reason that the combination of Sandholm and Takriti et al. fails to suggest the claimed invention.

Sandholm discloses a computer implemented method and data structures for solution of problems of the class equivalent to optimal allocation determination in a combinatorial auction. Bids are stored in a binary tree which is searched in conjunction with a stopmask data structure which allows, in effect, parts of the binary tree to be instantly pruned during search and in place.

The Examiner cites col. 1, lines 46 to 65, of Sandholm as disclosing "a method for identifying a cost minimizing bid set for reverse combinatorial auctions". The cited passage first describes combinatorial auctions, where the seller offers various combinations to prospective bidders, and then, at lines 62 to 65, mentions that a reverse auction, where the buyers are the auctioneers, may be had in the context of a construction contract offered to be bid upon by construction contractors. However, the Examiner attributes more to the cited passage than appears to be justified. Specifically, the Examiner states that this passage describes a method of identifying a cost minimizing bid set, but that does not appear to be the case. The cited passage is set out in the "Background" section of the Sandholm patent, and Applicants also

acknowledge that reverse combinatorial auctions are known (see pages 1 to 3 of the specification). However, Applicants also describe shortcomings in known methods.

Although there are seven steps recited in claim 1, the Examiner has accounted for only three in his treatment of the Sandholm patent. The Examiner states that "Sandholm fails to teach modeling demand constraints for each item using the bid variables", and further that "Sandholm fails to disclose modeling minimum and maximum numbers of suppliers based on the counting variables." For these two steps, the Examiner relies on the patent to Takriti et al.

Takriti et al. discloses a computer implemented tool for forecasting the spot price of electric power in a deregulated market and the amounts of power that may be traded. Using generating capacities of multiple utilities, price fluctuations, weather forecasts, and transmission variables, the computer implemented tool makes these forecasts at different delivery points, providing the decision maker with probabilistic distributions for spot prices for trading.

The Examiner cites col. 3, line 29, to col. 4, line 11, and col. 9, lines 29 et seq., of Takriti et al. as teaching "a tool for forecasting the spot-market prices of electrical power and trading transactions at different delivery points using statistical modeling demand constraints to manage risk more effectively and determine electrical cost minimization", and concludes that since "Sandholm contemplates a reverse combinatorial auction wherein a minimized cost is desirable", it would have been obvious "to integrate the modeling of command constraints, as taught by Takriti to provide the bidders an alternative means to provide optimal allocation in combinatorial auction." It is not clear what the Examiner has in mind in this modification of Sandholm but it should be observed that (1) Takriti et al. are solving a totally different problem than that solved by Sandholm, to wit, forecasting spot price of electric power, and (2) the claimed invention is to a process performed by the buyer, not the bidders. There appears to be no reasonable basis in the evidence for the

modification proposed by the Examiner and, in any case, the modification would not result in th claimed invention.

The method taught by Takriti et al. is not relevant to the claimed invention. The Takriti et al. method cannot be combined with a set covering model to generate a useful model bid evaluation – a fundamental reworking of the set covering model to incorporate business constraints is required. This reworking is not obvious from the combination of Takriti et al. with Sandholm. Note that Takriti et al. at column 9, lines 49 et seq., provides a method for sampling the uncertainty in price distributions and does not allow for the introduction of constraints on the number of winning suppliers. Similarly, the introduction of timestamps is novel since it requires the solution of a multi-objective problem that requires goal programming for which neither Sandholm nor Takriti et al. can be adapted.

Claims 2 and 3 were rejected under 35 U.S.C. §103(a) as being unpatentable over the patents to Sandholm and Takriti et al. as applied to claim 1 further in view of U.S. Patent No. 6,415,270 to Rackson et al. The Applicants' traverse of this rejection is respectfully maintained for the reasons advanced above that the combination of Sandholm and Takriti et al. fails to suggest the claimed invention as recited in claim 1 and the addition of the patent to Rackson et al. fails to cure the lack of teaching of the basic combination.

The Examiner states that "Sandholm as modified by Takriti fails to teach the auction is an [sic] single round and/or the auction is a multiple round auction." The Examiner cites the Abstract of the Rackson et al. patent as disclosing both single and multiple round auctions.

Rackson et al. disclose a multi-auction service system and method for replicating an item to be auctioned at a plurality of remote auction services, where the multi-auction service detects bids at the plurality of remote auction services for the

item in order to replicate the optimal bid at each of the remote auction services such that the optimal bid is afforded to a bidder or seller.

The method according to the claimed invention is unique in its ability to return solutions in real time and can be incorporated into an iterative format. This is not taught by Rackson et al., which provides a method for managing bids at multiple remote auctions. This is different from the claimed invention which refers to a single auction but provides a method for real time bid evaluation for an iterative multi-round format.

Claims 4 and 6 to 11 were rejected under 35 U.S.C. §103(a) as being unpatentable over the patent to Sandholm in view of U.S. Patent No. 6,321,132 to Dawande et al. and U.S. Patent No. 6,094,645 to Aggarwal et al. The Applicants' traverse of this rejection is respectfully maintained for the reason that the combination of Sandholm, Dawande et al. and Aggarwal et al. fails to suggest the claimed invention.

The Examiner states that "Sandholm fails to disclose creating a set-covering formulation from the bids", and cites the Dawande et al. patent as teaching "the use of set covering formulation approach as a solution for slab covering design", citing col. 6, lines 37 et seq. of Dawande et al.

Dawande et al. disclose a computer implemented method to design slabs (the manufacturing unit in the steel industry) for production from an order book. The method minimizes the number of slabs designed to fulfill an order book. All the products are manufactured based on orders instead of being based on a forecast of the expected demand. The goal is to minimize the number of slabs needed to be manufactured, which for a given order book is equivalent to maximizing the average size of the slab.

The Examiner further states that "Sandholm fails to disclose adding predetermined business rules as a constraint to the set-covering formulation", and

cites Dawande et al. as teaching "a set of 'compatibility conditions' that are used in the set-covering formulation as constraints", but the Examiner fails to point out where this is taught by Dawande et al. or what its relevance is. Dawande et al. teach a method for modifying the set covering model to include a set of compatibility conditions that are related to packing multiple items into a set. These compatibility constraints are based on whether members of a set are compatible with each other. These conditions are completely different from the business rules introduced in the claimed invention which relate to the cardinality of the set and hence lead to a fundamentally different mathematical model. The method of Dawande et al. cannot be adopted in any straightforward manner to model the business as shown in the claimed invention. In addition, note that one of the inventors of the Dawande et al. patent, Dr. Ho Soo Lee, is an inventor in the present invention and can state with high confidence the non-obviousness of the two models. As noted above, the method taught by Sandholm is unusable for mathematical programming based optimization models and cannot be adapted to incorporate new constraints.

The Examiner also cites the patent to Aggarwal et al. as teaching "using business rules as constraints to set-covering formulation [sic], automatically generating a computer-implemented representation of the set-covering formulation as constrained by the business rules", citing col. 4, lines 24 et seq. of Aggarwal et al.

Aggarwal et al. disclose a computer implemented method of online mining of inference rules in a large database comprising a preprocessing stage and an online rule generation stage. The method taught by Aggarwal et al. is inherently different than the one of the claimed invention which relates to identifying a cost minimizing bid set that satisfies a given set of business rules.

Claim 5 was rejected under 35 U.S.C. §103(a) as being unpatentable over the combination of the patents to Sandholm, Dawande et al. and Aggarwal et al., as applied to claim 4, further in view of the patent to Rackson et al. The Applicants'

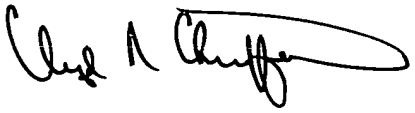
traverse of this rejection is respectfully maintained for the reasons advanced above that the combination of Sandholm, Dawande et al. and Aggarwal et al. fails to suggest the claimed invention as recited in claim 4 and the addition of the patent to Rackson et al. fails to cure the lack of teaching of the basic combination.

In view of the foregoing, it is requested that the application be reconsidered, that claims 1-11 be allowed, and that the application be passed to issue.

Should the Examiner find the application to be other than in condition for allowance, the Examiner is requested to contact the undersigned at 703-787-9400 (fax: 703-787-7557; email: clyde@wcc-ip.com) to discuss any other changes deemed necessary in a telephonic or personal interview.

If an extension of time is required for this response to be considered as being timely filed, a conditional petition is hereby made for such extension of time. Please charge any deficiencies in fees and credit any overpayment of fees to Deposit Account 50-0510 (IBM-Yorktown).

Respectfully submitted,



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